CLAIMS

What is claimed is:

1. A radiation detector comprising:

a plurality of housing components that define a vacuum chamber, wherein the housing components comprise a base, a window, and a first layer of a first heat activated sealant material interposed between the base and the window;

a sensor electrical pathway extending through a sensor feedthrough, wherein the sensor feedthrough is defined by at least one of the housing components and penetrates from within the vacuum chamber to external of the vacuum chamber;

a getter electrical pathway extending through a getter feedthrough, wherein the getter feedthrough is defined by at least one of the housing components and penetrates from within the vacuum chamber to external of the vacuum chamber;

a radiation sensor disposed within the vacuum chamber and in electrical contact with the sensor electrical pathway; and

a getter disposed within the vacuum chamber and in electrical contact with the getter electrical pathway.

2. The radiation detector of claim 1 wherein the plurality of housing components further comprises a frame interposed between the base and the window and a second layer of a second heat activated sealant material interposed between the frame and the base, and wherein the first layer of the first heat activated sealant material is interposed between the window and the frame.

3. The radiation detector of claim 1 further comprising

a stage upon which the radiation sensor is disposed;

a thermoelectric (TE) element disposed within the vacuum chamber between the base and the stage; and

a TE element electrical pathway extending through a TE element feedthrough, wherein the TE element feedthrough is defined by at least one of the housing components and penetrates from within the vacuum chamber to external of the vacuum chamber.

4. The radiation detector of claim 3 wherein the base defines the sensor feedthrough, the getter feedthrough, and the TE element feedthrough.

5. The radiation detector of claim 1 wherein the first heat activated sealant material and the second heat activated sealant material each comprise solder that includes indium and lead.

6. The radiation detector of claim 1 wherein the solder is fluxless.

7. The radiation detector of claim 1 wherein each feedthrough that is defined by at least one of the housing components is electrically connected to a detector component that is disposed within the vacuum chamber.

8. A radiation detector comprising:

at least two outer package components joined by a heat activated sealant material to form a hermetically sealed vacuum chamber;

a plurality of inner components within the hermetically sealed vacuum chamber;

wherein a pressure within the vacuum chamber is substantially equal to a sealing pressure of a processing chamber at a time the outer package components were joined to form the vacuum chamber within the processing chamber.

9. A method of making a radiation detector comprising:

assembling a lower detector assembly;

enclosing the lower detector assembly, a window, and a first solder entity within a processing chamber such that the window is spaced from the lower detector assembly;

reducing pressure within the processing chamber;

increasing temperature within the processing chamber;

maintaining a spaced relation between the window and the lower detector assembly until the first solder entity reaches a melting point;

moving at least one of the window and the lower detector assembly into contact with one another for forming a hermetically sealed compartment using the

interposed first solder entity; and

equalizing pressure between the processing chamber and external of the processing chamber while maintaining the reduced pressure within the hermetically sealed compartment.

10. The method of claim 9 wherein assembling a lower detector assembly comprises:

disposing a plurality of TE elements, a ceramic stage, a radiation sensor, and a getter all in fixed relation to the base, and

electrically connecting the sensor, the getter, and at least two TE elements to associated conductive pathways that pass through feedthroughs, each feedthrough being defined by the base.

11. The method of claim 9 further comprising reducing the temperature within the processing chamber after moving at least one of the window and the lower detector assembly into contact with one another.

12. The method of claim 11 wherein reducing the temperature within the processing chamber is characterized by an average rate of temperature reduction that is greater than 20 °C per minute.

13. The method of claim 9 wherein increasing temperature within the processing chamber includes raising the temperature according to a first and a second heat-up ramp.

14. The method of claim 13 wherein the second heat-up ramp raises temperature within the processing chamber no more than 20 °C per minute.

15. The method of claim 13 wherein the maximum temperature of the first heat-up ramp is below a melting temperature of the first solder entity, and the maximum temperature of the second heat-up ramp is at least above the melting temperature of the first solder entity.

16. The method of claim 9 wherein enclosing the lower detector assembly, a window, and a first solder entity within a processing chamber includes also enclosing a frame and a second solder entity within the processing chamber, and further wherein the frame is spaced from one of the lower detector assembly or the base.

17. The method of claim 16 wherein the first and second solder entities each comprise a solder pre-form.

18. The method of claim 16 wherein the first and second solder pre-forms are temporarily fixed to the frame by a press.

19. The method of claim 9 wherein maintaining a spaced relation between the window and the lower detector assembly includes activating the getter by resistive heating prior to reaching a melting point of the first solder entity.

20. The method of claim 9 as applied to at least two detectors, both detectors being simultaneously subjected to varying pressures and temperatures within a single processing chamber.

21. A method for assembly of a radiation detector having an outer package enclosing inner components, comprising:

placing radiation detector components within a processing chamber with a heat-activated sealant material disposed between at least two outer package components that are disposed in a spaced-apart fashion from one another;

reducing gas pressure within the processing chamber;

increasing the temperature within the processing chamber for activating the sealant material;

urging the spaced-apart outer package components into contact for sealing them together using the activated sealant material; and

removing the radiation detector from the chamber, where the radiation detector outer package maintains the reduced gas pressure around the internal components after removal from the chamber.

22. The method as in claim 21, where the heat activated sealant material comprises solder.

23. The method as in claim 22, where the solder is provided as a solder pre-form having a shape that is predetermined to correspond to a shape required to seal the two outer package components together.

24. The method as in claim 21, where one of the at least two outer package components comprises a window for admitting incident radiation into the outer package.

25. The method of claim 21 further comprising reducing the temperature within the processing chamber prior to removing the radiation detector from the chamber.

26. The method of claim 21, where urging the spaced-apart outer package components into contact includes moving at least one extensible arm within the processing chamber to urge the spaced apart outer package components into contact.

27. The method of claim 21, where placing radiation detector components within a processing chamber comprises placing components of a first and a second detector within the chamber such that a first outer package component of the first detector and the first outer package component of the second detector are carried by a common plate within the processing chamber.